

S/N 09/338,045
Docket: GB919980092US1

REMARKS

Claims 31, 32, and 38-42 are all the claims pending in the present Application. New claims 38-42 have been added. Applicant gratefully acknowledges the Examiner's indication that claims 31 and 32 would be allowable if rewritten in independent format and has accordingly rewritten these two claims. Claims 1-30 and 33-37 are canceled.

It is noted that the new claims herein are intended solely to more particularly point out the present directed invention for the Examiner, and not for distinguishing over the prior art or the statutory requirements to patentability. Applicant is concerned that the Examiner is attempting to read "object data structure" of canceled claims 21-30 and 33-37 onto the objects of Houldsworth.

It is further noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Claims 21-28 and 37 were rejected by the Examiner under 35 USC 101, and claims 21-30 and 33-37 were rejected under 35 USC 103(a). Although these claims are canceled above, these rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

As described and claimed, for example, by new claim 38, the present invention is directed to a method of garbage collecting memory, where the memory has objects, the objects having object references in a thread stack, including retrieving an object pointer structure from the thread stack. From the object pointer structure, a reference to its corresponding object and a reference to a next object pointer structure are extracted. The retrieving and extracting steps are performed with respect to the next, subsequent and last object pointer structures, whereby the retrieved object references identify a root set of objects within the memory. The memory not used by the root set of objects is reclaimed.

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II. THE 35 USC §101 REJECTION

Although claims 21-28 and 37 have been canceled, Applicant wishes to address this rejection in case the Examiner should consider that this rejection would apply to new claims 38-42.

The Examiner alleges that the invention defined by these claims are rejected because:

"... the disclosed invention is inoperative and therefore lacks utility. The claim merely sets forth a method of retrieving object references in a thread stack, not a concrete method or a computer program product. According to the examination Guidelines for Computer-Related Inventions, 1206 OG 211, see also M.P.E.P 2106, a statutory process must either result in a physical transformation outside the computer for which a practical application is either disclosed in the specification or would have been known to a skilled artisan, or be limited by the language of the claim to a practical application within the technological arts. The content of these claims does not constitute a statutory process, machine, manufacture or composition of matter. Correction is required."

Applicant respectfully disagrees with the above analysis, for the following reasons.

First, Applicant submits that the present invention is indeed operative and that it does indeed provide utility in the technological arts. That is, since the present invention relates to managing memory of a computer, it directly interacts with the hardware of a computer, thereby providing a clear utility.

Second, the current standard for statutory subject matter for computer-related technology is that articulated by the Federal Circuit Court of Appeals in *State Street*, as updated by *AT&T Corp* to equally apply to a process: whether a *useful, concrete, and tangible result* is produced.

More specific to the present application, memory space is freed up in a computer memory by the method of the present invention. This result is a physically-detectable change in the state of a computer memory that is measurable with the proper tool. The present invention, therefore, inherently qualifies under the *State Street* standard. It additionally qualifies under the requirement that it provide utility in the technological arts.

III. THE PRIOR ART REJECTION

The Examiner alleges that canceled claims 21-30 and 33-37 are unpatentable over US Patent 6,314,436 to Houldsworth, further in view of US Patent 5,848,424 to Ebrahim et al.

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Applicant respectfully disagrees.

Neither Houldsworth nor Ebrahim discloses linked object references in a thread stack identifying a root set of objects for garbage collection in a computer memory. Further, these references are directed to different objectives and would not likely have been combined by one of ordinary skill in the art.

Houldsworth assumes the existence of a root set of references. It does not offer any means of extracting such a root set and is, therefore, irrelevant.

Ebrahim offers a single method of extracting a root set of references from a thread. This method is not by the linking of object references. Moreover, Ebrahim deals with the case of locating references in activation frames built by a specific Java interpreter or the JIT. Ebrahim is compiler dependent because modification to the activation frames is performed by the specific compiler of the invention.

In contrast, the present invention deals with the case where the frame is built by any compiler (e.g., one of a number of C compilers) in which there is no control of the layout of the activation frame itself. Hence, the present invention builds a new object pointer structure within the activation frame and links it to the previous such structure on the stack. The present invention then walks through the list of such structures when it comes time to identify the root set.

Ebrahim uses an entirely different method of extracting a root set in a single, isolated environment and it would not be obvious to one of ordinary skill in the art that Ebrahim's method to modify this isolated method to cope with the case where activation records are not under control of the compiler.

Hence, turning to the clear language of the claims, there is no teaching or suggestion of " ... retrieving an object pointer structure from the thread stack; extracting, from the object pointer structure, a reference to its corresponding object and a reference to a next object pointer structure; performing said retrieving and said extracting with respect to a next, subsequent and last object pointer structures, whereby the retrieved object references identify a root set of objects within the memory ...", as required by claim 39.

For the reasons stated above, the claimed invention is fully patentable over the cited references.

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Further, the other prior art of record has been reviewed, but it too, even in combination with Houldsworth or Ebrahim, fails to teach or suggest the claimed invention.

IV. FORMAL MATTERS AND CONCLUSION

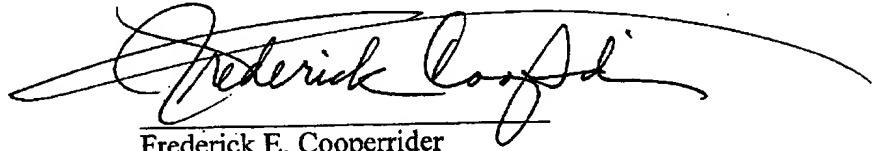
The Examiner objected to the title. Applicant has accordingly rewritten the title and respectfully requests that the Examiner reconsider and withdraw this objection.

In view of the foregoing, Applicant submits that claims 31, 32, and 38-42 all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview. The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

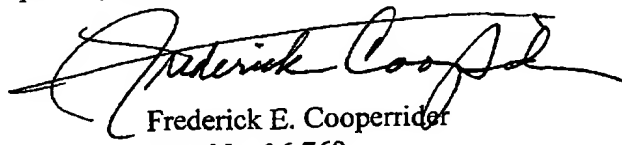
Date: 4/14/03


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CERTIFICATION OF TRANSMISSION

I certify that I transmitted via facsimile to (703) 746-7239 this Amendment Under 37 CFR §1.111 to Examiner T. Pardo on April 14, 2003.


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